

## **REMARKS/ARGUMENTS**

### **Claim Amendments**

Claim 1 is amended to state that the cleaning events are performed generally periodically at a frequency of at least one cleaning event per week. This amendment is supported by page 9, lines 4-5; page 12, line 4; and, page 13, lines 5-21. Claim 1 is further amended, in part B(b), to refer to backwashing a chemical cleaner through the membranes. This amendment is supported by page 3, line 28 and page 4, lines 4 and 11. Part (b) of claim 5 is amended as for part (B)(b) of claim 1. Claim 6 is amended to refer to cleaning events performed generally periodically at a frequency between 1 and 7 times per week. These amendments are supported as for the similar amendments made to claim 1. Claim 12 is amended to delete the references to upper limits of the pulse and waiting period duration. Claim 13 is amended to replace the reference to chemical cleaner adjacent the membranes to chemical cleaner in tank water adjacent the outsides of the membranes. This amendment is supported by page 10, line 21 to page 11, line 2. Claim 16 is amended to state that chemical cleaner is removed through a drain in the tank. This is supported by page 17, lines 8-11. Claim 17 is similarly amended. Claim 36 is amended to correspond with claim 1 on which it depends. Claim 38 is amended to add that the water is replaced between steps (B)(b) and step B(c) of claim 1 which corresponds, in that respect, to claims 16 and 17 and is supported by page 7, lines 14 to 31; page 15, line 9; and, page 17, lines 8-13. The Applicants submit that no new matter is added by these amendments.

### **Claim Rejections – 35 USC 103**

Claims 1-17 and 27-38 are pending. All pending claims were rejected as being obvious over Smith et al (US 5,403,479) in view of Applicants' alleged admissions of known prior art. The Applicants respectfully disagree with these rejections and submit that all claims, at least as amended, are allowable.

Regarding claim 1, the Office Action states that Figures 4 and 6 of Smith have one or more cleaning events per week. However, neither Figure shows cleaning events, as defined in claim 1, performed generally periodically at a frequency of at least once a week between first cleanings as defined by the claims. Figure 4 in particular does not even have cleaning events performed generally periodically at any determinable frequency. The Office Action further states that Smith teaches flowing a chemical cleaner through the membrane in reverse direction of permeate flow. This is not actually the case since that would require flow of cleaning chemical into both header 11 and 11' (see Figure 2) simultaneously which is not described in Smith. Further, the primary process taught by Smith is one in which biocidal solution is drawn from a tank, enters into one header, exits from the other header and flows back to the tank thereby circulating the solution through the membranes (for example, see column 17, lines 32-53). Figure 4 relates to such a recirculating process (see column 18, lines 41-66) as does Figure 6 (see column 20, lines 54-56). Although Smith mentions blocking the flow of biocidal solution, or "dead ending" the biocidal solution, this method is not preferred (see column 12, lines 66-67) and, in one reference, even denied as being part of the Smith invention (column 11, lines 62-63).

Regarding the CT ranges, the Office Action provides a set of references from Smith. The reporting of the first reference, to line 9 of a table, is incorrect. The table gives only a concentration, does not give a time and does say how many times per week a dose of that concentration would be applied. The other citations similarly each describe only 1 parameter and are not linked by any teaching in Smith to choices of other parameters as would be required to find any disclosure in Smith of a weekly CT. Further, the concentrations extracted from Smith in the Office Action are not representative of the overall teaching in Smith even to that single parameter. In other places, Smith states a preference for higher concentrations of about 300 ppm OCL<sup>-</sup> (435 mg/L NaOCl) (column 19, lines 6-25).

Regarding the combination of first cleanings and cleaning events in claim 1, the Office Action acknowledges that Smith does not teach such a combination. However, the Office Action also cites page 2, lines 6-7 of the specification. This reference describes a combination of "periodic regular cleaning" and intensive recovery cleaning. But "periodic regular cleaning" is defined in the immediately following page 2, lines 8-19 as being a backwash with air or water at sufficient force to physically push solids off of the membranes. This is not a cleaning event as defined by the claims. Similarly, in Smith column 9, lines 18-20, the back-flushing is with permeate (see line 2) which is also not a cleaning event as claimed by the Applicants. No other reference or combination of references cited in the Office Action provides prima facie evidence that a combination as claimed by the Applicants is obvious.

The Applicants submit that all other pending claims are similarly allowable for one or more reasons given in relation to claim 1 and further because the Office Action does not provide prima facie evidence that those claims are obvious or that the applications of *In re Boesch* or inherency doctrines are justified. However, some particular claims will be discussed in additional detail below.

Regarding claim 5 and its dependants, when Smith provides a pulsed flow, the biocidal fluid is recirculated by the pulse and not backwashed in a direction opposite the direction in which permeate normally passes through the membranes (column 17, lines 45-56). Smith does not teach a combination of pulsing and "dead end" flow. Such a combination would be against the teaching of Smith about the purpose of the pulses. There is also nothing to indicate that someone using a recirculating system as in Smith, and optimizing according to the stated purpose of pulsing as in Smith, would arrive at the additional elements of claims 11 and 12. Aside from the processes being different, the minimum pulse durations claimed by the Applicants are twice as long as the maximum taught by Smith which indicates against application of the *In re Boesch* doctrine.

Regarding claim 15, permeability of membranes is related to their average pore size and their porosity (density of pores). The application mentions pore sizes ranging from 0.003 to 10 microns (page 7, lines 3-7). Similarly, Smith refers to a range of pore sizes from 50 angstroms to 5 microns (column 11, lines 41-42). Thus pore sizes have at least two orders of magnitude of variation. Porosities for a given pore size may also vary and Smith discusses pressures ranging from 0.1 psi to 100 psi, another 3 orders of magnitude of variation. Given these vast potential variations, the Applicants submit that the specific flows in claim 15 are not inherent in the Smith disclosure.

Regarding claims 16 and 17, withdrawing the chemical cleaner from the lumens in Smith, column 12, lines 64-66, is not removal as retentate or removal through a drain in the tank.

Regarding claims 31 and 35, none of the cited references states that there is no agitation. In contrast, column 17, lines 7-56 of Smith describe that air is provided through a gas distribution means (lines 22-24) in Figure 2 which is configured to have a flow of biocidal solution through the membranes (lines 45-50). Agitation, as the word is used in the present application, includes aeration (page 8, lines 4-6).

Regarding claim 33, Smith does not teach 70% recovery of flux, but rather restoring flux after each cleaning procedure to at least 70% of an initial flux. Thus each application of the cleaning process in Smith is intended to meet or exceed the same, constant, goal. As shown in Figures 4 and 6, for example, later cleaning instances in Smith can produce fluxes exceeding those produced in earlier cleanings. In claim 33, the flux produced after a later cleaning event is less than the flux produced by a preceding cleaning event.

Regarding claim 36, introducing a chemical cleaner to flowing water is not "equivalent" to providing chemical cleaner in a tank. For example, Smith teaches

recirculating the biocidal solution, the biocidal solution being drawn through the tank, passed through the lumens of the membranes and returned to the tank. This recirculation would not work with the process of claim 36.

Regarding claim 38, the amendments make the statements in the Office Action about replacing water removed during permeation inapplicable. Smith also teaches against draining the tank (column 11, lines 24-25) and the Office Action does not provide prima facie evidence why a person skilled in the art who had any reason to drain a tank would want to use any process in Smith or be taught by Smith towards the Applicants' claimed process.

The Applicants submit that the further remarks in the "Response to Arguments" section of the Office Action do not provide prima facie evidence of obviousness nor otherwise detract from the patentability of the claims.

For the reasons above, the Applicants submit that the claims are allowable.

Respectfully submitted,

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